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STATE OF ALASKA
Walter J. Hickel, Governor

ANNUAL REPORT OF PROGRESS, 1967 - 1968

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-9

SPORT FISH INVESTIGATIONS OF ALASKA

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INTRODUCTION

This report of progress consists of findings and work accomplished under the State of Alaska Federal Aid in Fish Restoration Project F-5-R-9, "Sport Fish Investigations of Alaska."

The project during this reporting period was composed of 21 separate studies. Of these, seven jobs continued the inventorying and cataloging of the numerous waters, providing a comprehensive index of the State's recreational waters. Nine jobs accomplished special studies involving Dolly Varden, grayling, silver salmon, king salmon and sheefish, among others. The remaining five jobs are designed to accomplish creel census, migration, access and silver salmon egg-take studies. The egg-take study, Job 7-F, was inactive because egg-takes were accomplished under other projects.

Special reports on specific phases of the Dolly Varden Life History Study have been published in the Department's Research Report series.

The information gathered from all of these studies provides the background necessary for better management and assists in development of future investigational studies.

The subject matter contained within these reports is often fragmentary in nature. The findings may not be conclusive and the interpretations contained therein are subject to re-evaluation as the work progresses.

RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.

Project No: F-5-R-9 Title: Grayling Investigations on Tolsona and Moose Lakes.

Job No: 14-B

Period Covered: May 1, 1967 to April 30, 1968.

ABSTRACT

Traps for capturing grayling, Thymallus arcticus (Cope), were operated in Our Creek and Bessie Creek, tributaries to Moose and Tolsona Lakes, from May 9 through May 20, 1967. A total of 3,112 grayling was taken.

In 1967, 46 grayling, marked at Bessie Creek in 1966 and released in Tolsona Lake, were caught at Our Creek, the main inlet to Moose Lake. Fifteen percent of the 1,154 grayling marked in 1966 were recovered in 1967. Seventy-two percent of the grayling caught at Bessie Creek were age IV, 25 percent were age III and the remaining 3 percent were age V.

During the spring spawning migration a rise in creek water temperatures was accompanied by a corresponding increase in upstream fish movement.

Fecundity counts showed an average of 4,490 eggs per female grayling that averaged 311 millimeters in fork length.

Test gill netting in Moose and Tolsona Lakes since 1963 shows a drop in numbers of grayling per net hour.

Spawning grayling enter the mouths of Bessie and Our Creeks when the first water flow begins irrespective of solid ice conditions only 50 yards upstream. Fish entered Our Creek four to five days prior to any upstream movement into Bessie Creek.

RECOMMENDATIONS

1. It is recommended that collection of young-of-the-year and immature grayling be intensified. Scale samples from these fish to be used to help verify age and growth data.
2. It is recommended that observations be conducted after the spawning period to determine hatching time and downstream migration of the grayling fry.
3. It is recommended that the upper reaches of the Tolsona-Moose Lakes drainage be surveyed.
4. It is recommended that any experimental egg-takes conducted in 1968 be restricted to Our Creek and that an enumeration be made of all Tolsona Lake fish passing into Bessie Creek.
5. It is recommended that other aspects of this study such as determination of fecundity, timing of runs, age and growth, interchange of grayling between the two major lakes and the effects of artificial spawn taking be continued.

OBJECTIVES

1. To determine the numbers and timing of grayling entering Our Creek and Bessie Creek for spawning purposes and the factors affecting this movement.
2. To determine the size and age of the spawning grayling.
3. To determine the frequency of spawning.
4. To determine the magnitude of interchange of grayling between the two lakes, if applicable.
5. To determine the maturity composition by sex, age, and size of the migrant grayling.
6. To determine the effects of egg taking on the wild population of grayling present in Moose and Tolsona Lakes.

TECHNIQUES USED

1. Traps were installed in Our Creek and Bessie Creek to capture all migrant grayling from Moose and Tolsona Lakes throughout the spawning migration.
2. All fish taken were marked with fin clips and tags appropriate to the trap where captured.
3. Fork lengths in millimeters were taken from all fish tagged and from 10 percent of those fin clipped.
4. Scale samples were taken for aging purposes.
5. Ovaries were taken from sample fish to determine fecundity.

FINDINGS

The Tolsona-Moose Lake complex consists of two large lakes and 15 "pot-holes" connected by small, some intermittent, streams (Figure 1). The two major lakes, Moose and Tolsona, have estimated surface areas of 320 acres each. The area drained by this complex is 10 square miles. The terrain is generally low rolling hills and includes at least three square miles of swamp type habitat. Runoff is supplied primarily from snow accumulation, and by late July and early August the runoff does not exceed three cfs. The area is covered with black spruce interspersed with stands of aspen, alder and willow.

Moose Lake has a maximum depth of 30 feet while Tolsona is only 14 feet deep. The major inlet into Moose Lake is Our Creek. Moose Lake in turn drains into Tolsona Lake via Bessie Creek. The drainage from Tolsona Lake is to Tolsona Creek and hence into the Tazlina River. The outlet of Tolsona Lake has a man-made barrier which prevents upstream migration of all fish and downstream movement of adults. The barrier also serves as a water level control structure for Tolsona Lake.

Fish species in this drainage include grayling, Thymallus arcticus (Pal-lus); whitefish, Coregonus clupeaformis (Mitchell); burbot, Lota lota (Lin-naeus); and longnose suckers, Catostomus catostomus. Rainbow trout, Salmo gairdneri (Richardson) and silver salmon, Oncorhynchus kisutch (Walbaum) have been stocked in Tolsona and Moose Lakes intermittently since 1961; however, creel census has shown that the return to the creel of these stocked fish is not commensurate with the numbers introduced. Winter oxygen determinations indicate that concentrations may be too low for sustained survival of salmonoids.

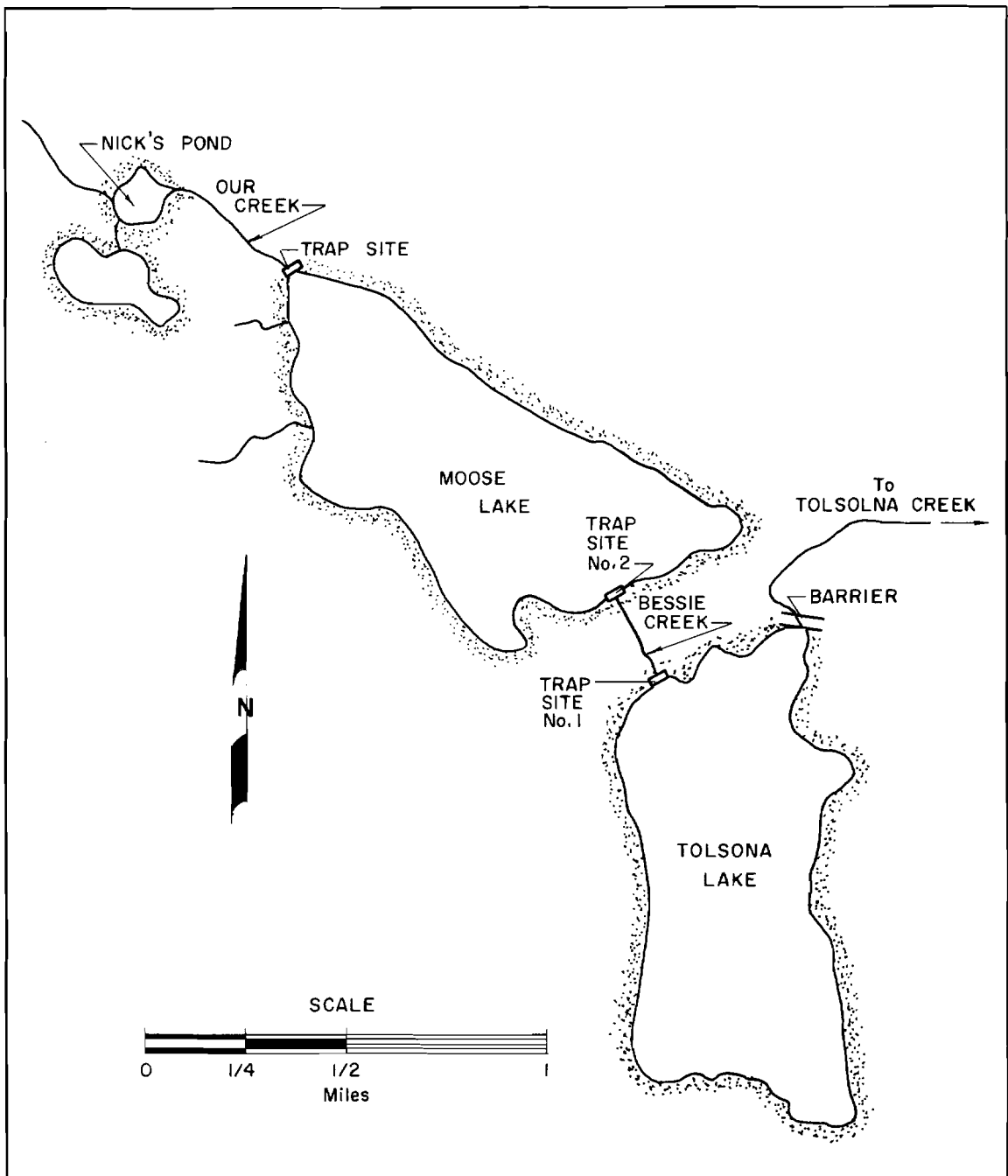


FIGURE 1. MAP OF TOLSONA-MOOSE LAKE SYSTEM

The first experimental grayling egg take was made in 1965 at Bessie Creek. This operation was repeated in 1966 and 1967. The number of fish trapped has declined since 1965 (Table 1). Our Creek, while less accessible, is more adaptable to trap installation and the total run of grayling in 1967 (estimated 3,000 fish) was such that an egg take would be feasible.

TABLE 1. A Summary of the Number of Grayling and Eggs Taken at Bessie Creek From 1965 Through 1967.

Year	Av. No. of Eggs Per Female	FL Range of Males (mm)	Av. FL of Males (mm)	FL Range of Females (mm)	Av. FL of Females (mm)	Total Run
1965	4,269	---	312	---	312	3,000
1966	3,735	229-376	279	216-351	302	2,645
1967	2,574**	215-356	301	211-322	273	671 trapped*

* Because of severe ice conditions an unknown number of grayling escaped the trap by going under the ice.

** Many fish not fully ripe; large percentage of eggs retained; see fecundity count section.

Bessie Creek #1

Bessie Creek is a small stream (average four feet wide and less than one foot in depth) which connects Moose and Tolsona Lakes. The stream is 1,500 feet long and almost devoid of any fish cover. The stream banks are sparsely covered with small willows. The stream is man made, having been built about 1960 to divert water from Moose Lake into Tolsona Lake.

The first grayling entered the stream in 1967 on May 14. In 1966, the first grayling appeared on May 9, and in 1965 it was some time prior to May 13. The grayling enter the mouth of the stream even before it becomes completely ice free and while most of the upper portion of the creek is still frozen.

Water temperatures at the mouth of Bessie Creek at the time the first grayling enter it range from 34° to 36°F. Throughout the spawning period the temperatures vary from 36° to 44°F. Late evening water temperatures generally stand at 36° to 38°F. and rise during the daylight hours.

Because of the lack of protection and cover in the stream the grayling normally enter the stream only at dusk and after dark. This is in contrast to Our Creek where grayling enter the stream during all hours. The reason assumed being the difference in the depth of the streams and the greater amount of shelter provided at Our Creek.

When left undisturbed, grayling enter Bessie Creek in the evening and return to Tolsona Lake when daylight approaches. The exception to this activity is the movement of grayling from Bessie Creek into Moose Lake and hence to Our Creek, plus some fish that have a daily movement downstream from Moose Lake.

One hundred-twenty grayling caught in the Bessie Creek trap in 1967 had been adipose fin clipped in 1966. The sex ratio of this group was almost 1:1. In all traps during 1967 (Bessie #1, Bessie #2, and Our Creek) 15 percent of the 1,154 grayling which were marked by adipose fin clips in 1966 at Bessie Creek #1 were taken.

Two hundred of the grayling taken at Bessie #1 in 1967 were tagged with subcutaneous tags and the right ventral fin was removed. The remainder were marked by removal of the same fin.

Scale samples from 70 grayling were analyzed for age. Seventy-two percent of the fish were age IV, 25 percent were age III, and the remaining three percent were age V. In 1966, 64 percent of the grayling aged were age III.

Table 1 shows a 29 mm decrease in the average size of females from 1966 to 1967. The grayling used in this tabulation were those used for experimental egg taking. This table also shows an average decrease in the number of eggs per female of over 1,000. The slightly smaller size of the female grayling does not account for the great difference in eggs per female. This decrease in number of eggs is a reflection of the inexperience of some of the egg-taking personnel who spawned partially ripe females while working at the weir site.

A trap was installed in Bessie Creek #2 approximately 100 yards below Moose Lake to determine the magnitude of the spawning run downstream from that lake. The trap was attended two days and then abandoned because of a decline in numbers being caught and the presence above and below the trap of grayling. One hundred and eighty-four grayling were taken. Six of these had been marked in 1966 at Bessie Creek #1. The remaining fish were tagged with a subcutaneous tag and the left ventral fin removed. Fifty-four percent of the fish were age IV, 37 percent were age III and the remainder age V. Scales were read from 106 fish.

Water temperatures were taken at 8:00 a.m. each day while the Our Creek trap was in operation. Table 2 shows the influence of water temperature on the upstream migration of the spawning grayling. An increase in water temperature was accompanied by an increase in upstream movement of the fish.

TABLE 2. Water Temperatures and Trap Catch of Grayling at Our Creek, 1967.

<u>Date</u>	<u>Water Temperatures in Fahrenheit</u>	<u>Daily Catch</u>
May 9	36	---
May 10	37	220
May 11	36	60
May 12	37	126
May 13	39	220
May 14	40	257
May 15	40	373
May 16	36	22
May 17	36	52
May 18	40	293
May 19	40	431
May 20	40	203

All of the grayling caught in the Our Creek trap were marked by removing the left pectoral fin with the exception of 46 which had been adipose-fin clipped at Bessie Creek in 1966. Trapping was discontinued on May 21. The total catch of grayling was 2,257 but would have probably reached 3,000 if trapping had been continued.

Tagging and Recovery

During the 1967 trapping operations, 378 grayling were tagged with subcutaneous tags and 2,522 fish were marked with fin clips. Creel census and public appeals for the return of tags by anglers resulted in no returns.

Test netting was conducted in Moose and Tolsona Lakes during July, 1967. The only marked fish taken were from Moose Lake. Four grayling taken had been marked at Our Creek in May, 1967; one grayling had been tagged at Bessie Creek trap #1 during the same period, and the one fish had been tagged at Bessie Creek trap #2 in 1967.

Fecundity Counts

Fecundity counts were made from female grayling collected at Bessie Creek on May 20. Eight grayling ranging in fork length from 263 to 342 mm, with an average of 311 mm, were killed, ovaries removed and all eggs counted. Egg counts varied from 3,952 to 4,812 with an average of 4,490.

Our Creek Trap

Our Creek is a narrow (maximum of six feet) stream with undercut banks, heavy shoreline vegetation and numerous brush jams. All of these physical features provide excellent cover even during the daylight hours. Fish are to be found in the stream during all hours of the day and night and upstream migration from the lake is not restricted to the darkness hours as is the case in Bessie Creek.

The weir was installed in Our Creek on May 9 after considerable trouble with anchor ice. It was observed in 1965, 1966 and 1967 that grayling enter the stream almost immediately after the ice melts enough to create water flow. The presence of anchor ice inhibits but does not prevent the fish from moving upstream seeking spawning areas.

None of the fish enumerated at Our Creek were used for egg taking purposes but were released upstream from the trap. Forty-nine percent of the grayling sampled (N=132) were found to be age III, and 47 percent were age IV. Measurements of all males in a 221-fish sample gave a fork length average of 279 mm, which is somewhat less than the average fork length of 301 mm for the Bessie Creek male grayling. Females were almost the same average length for both trapping locations, with an average length of 270 mm for Our Creek grayling and 273 mm for Bessie Creek fish. The difference is not considered significant because of the interchange of grayling between the two lakes. Forty-six of the grayling trapped in Our Creek in 1967 had been marked with an adipose fin clip at Bessie Creek in 1966. Less than one percent of the grayling trapped at Our Creek were immature.

A relatively large number of grayling that enter Our Creek in May continue up the stream and reside in two small ponds located approximately one-fourth mile upstream from Moose Lake. Prior to complete freeze-up these grayling return to Moose Lake. The two ponds are less than seven feet deep and over-winter survival is not possible. In the fall of 1966 it was necessary to open a beaver dam on Our Creek to allow an estimated 400 grayling, trapped in the pond, to return to Moose Lake.

TEST NETTING

Test gill netting has been conducted at Moose and Tolsona Lakes since 1963. This netting has been carried out in the same localities during July of each summer. The results of this netting are shown in Figure 2. The number of fish per net hour increased rapidly from 1963 through 1966 but in 1967 it dropped considerably. In Tolsona Lake the number of fish per net hour dropped from 4.27 in 1966 to 0.14 in 1967.

This decline in net-hour numbers of fish corresponds roughly to the drop in the number of grayling taken in the trap at Bessie Creek #1 during 1967. However, it should be mentioned that an unknown number of fish escaped the trap by going under the ice. This occurred during the first two days of trapping when the largest numbers of fish normally enter the stream.

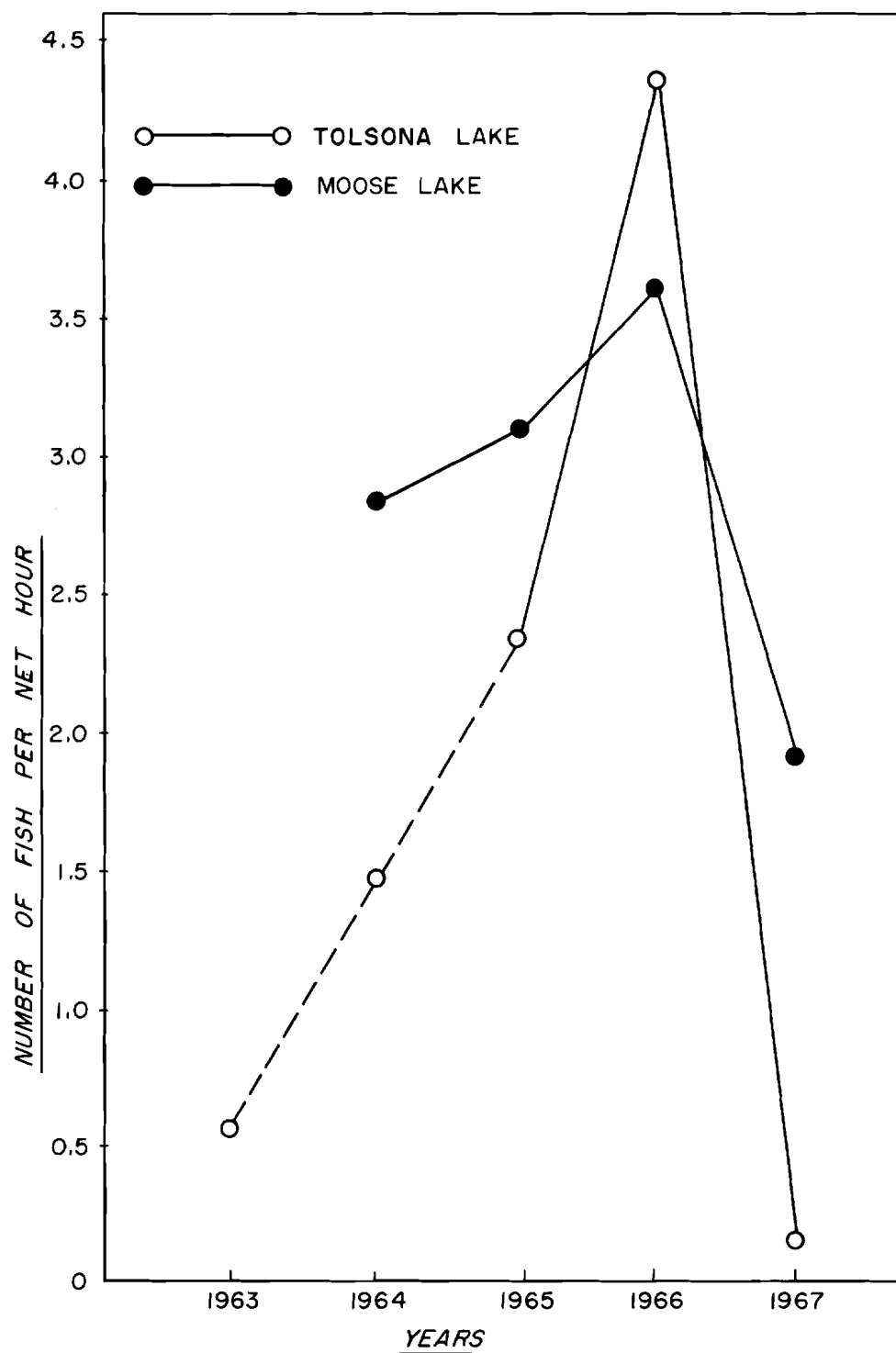


FIGURE 2. TEST NET FREQUENCIES FOR GRAYLING IN MOOSE AND TOLSONA LAKES DURING 1963-1967,

LITERATURE CITED

Williams, Fred T. 1964. Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Copper River and Prince William Sound Drainages. Alaska Department of Fish and Game, Annual Report of Progress. 1963-1964. Vol. 5:325-336.

_____. 1965. Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Copper River, Susitna River above the Oshetna River and Prince William Sound Drainages. Alaska Department of Fish and Game, Annual Report of Progress. 1964-1965. Vol. 6:273-290.

_____. 1966. Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Copper River and Prince William Sound Drainages, and the Upper Susitna River. Alaska Department of Fish and Game, Annual Report of Progress. 1965-1966. Vol. 7:185-213.

_____. 1967. Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Copper River and Prince William Sound Drainage, and the Upper Susitna River. Alaska Department of Fish and Game, Annual Report of Progress. 1966-1967. Vol. 8:217-230.

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